

July 14, 1932

LUMINOUS PAINTS

Self-luminous materials -- paints containing radioactive substances -- were studied by the Bureau of Standards during 1917-1920, primarily for military purposes. With the exception of a brief report issued by the National Advisory Committee for Aeronautics (Fourth Annual Report, 1919), the results have not been published.

Although the Bureau of Standards has made no other investigation of luminous paints, the following general information and references may be useful.

The older (and also inferior) type of luminous paints did not contain a radioactive substance, but depended upon the luminous properties of specially prepared impure sulphides of calcium, strontium, or barium. These paints, however, are luminous only under certain conditions and only for short periods immediately after exposure to light. Since this is a phosphorescent property, a common but erroneous idea is more or less prevalent that such paints contain phosphorus. Luminous paints can not be made from phosphorus, and any attempt to do so is extremely dangerous.

Apparently the pure sulphide of calcium does not phosphoresce, so that this property is due to the presence of minute quantities of foreign substances. Traces of other elements, such as bismuth, cadmium, manganese, etc., modify the color of the phosphorescent glow.

In making a paint from luminous calcium sulphide, it appears to be common experience that ordinary oleoresinous varnishes or raw linseed oil are not suitable liquids. Likewise the usual lead driers should not be used. Lacquers, spirit varnishes, (alcohol-shellac varnish), gum arabic solution, and damar varnish are suitable vehicles.

The luminous paints that are used today for painting the numbers or letters on watch and clock dials, compasses, etc., contain a minute amount of radioactive substance such as mesothorium on a responsive base, usually zinc sulphide. These paints being radioactive do not require any prior exposure to light.

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However, such radioactive pigments often cause serious injury to workers and we advise extreme caution in using them. The cost of these pigments is very high, as compared with luminous calcium sulphide, but as little as a gram of the material can probably be purchased. The prices vary depending upon the content of radioactive material. The higher the content of this, the greater the cost, and likewise the brighter the material.

The Bureau of Labor Statistics of the Department of Labor has made two surveys to investigate the startling developments of radium poisoning among workers applying luminous paints to clock and watch dials. Summaries of these are given in the Monthly Labor Review for May, 1926, and June, 1929. As a result of these investigations it was advocated to discontinue the use of radioactive materials for this purpose, but up to the present time no laws have been enacted in the United States on the subject.

Some recommendations have been made by State factory inspectors to individual establishments engaged in such work for extreme caution in methods and in handling of the materials. The only legislation in connection with the subject has been in regard to workmen's compensation. The many cases appearing in New Jersey resulted in the addition of radium-mesothorium necrosis to the list of compensatable occupational diseases in that State in 1927, and in 1930 the State of New York included radium poisoning as a compensatable occupational disease.

The following references contain information on this subject:

Dorsey, N.E., Self-luminous materials, Report No. 33 in Fourth Annual Report, National Advisory Committee for Aeronautics (Government Printing Office, Washington, D.C.), 1919.

Raaland, E.R., Luminous paints and colors, American Paint Journal (St. Louis, Mo.) vol. 24, No. 34, p. 18, June 9, 1930.

Parson, A.T., Radium, with special reference to luminous paint, Journal Oil and Colour Chemists Assn. (London, England), vol. XII, p. 2, 1929.

Gardner, H.A., Van Heuckeroth, A.W., and Faust, J.B., Some notes on luminous paints, Cir. No. 272, Paint Manufacturers' Assn. of the United States (Washington, D.C.), May, 1926.

Barry, J. Hedley, Luminous paints, The Decorator (London, England), September, 1928.

Bearn, J.C., Luminous paints, Paint and Varnish Production Manager (New York, N.Y.), vol. 5, Nos. 4, 5, and 6.

Luminous calcium sulphide can probably be furnished by:

Pfaltz & Bauer, Inc., 300 Pearl St., New York City.

American Luminous Products Co., Huntington Park, Calif.

J. T. Baker Chemical Co., Phillipsburg, N. J.

Merck & Co., Inc., Lincoln Ave., Rahway, N. J.

Radioactive pigments and vehicles for the same can probably be furnished by:

U. S. Radium Corp., 535 Pearl St., New York City

Radium Chemical Co., Flannery Bldg., Pittsburgh, Pa.

American Luminous Products Co., Huntington Park, Calif.

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$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$

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